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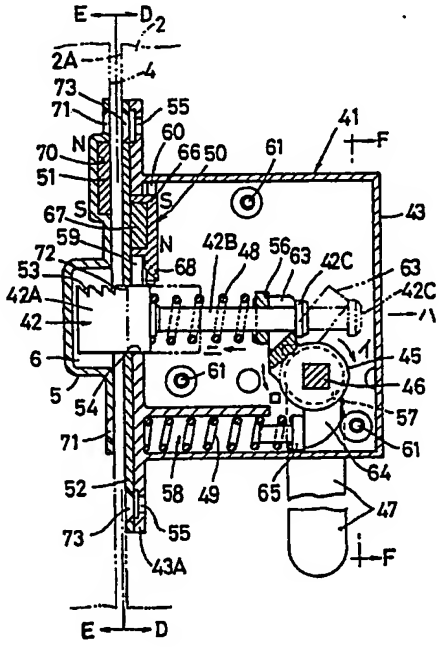
(54) DOOR LATCH LOCK

(57) A door latch lock has a casing (41), a handle, a latch (42) movable to a position in which it protrudes from the casing for engagement with a striker plate, means (68) to restrain the latch when it has been withdrawn by the handle from said position from returning to said position and means (51, 67) to terminate the operation of the restraining means on closure of the door. With this arrangement the latch is restrained within the lock casing but is automatically allowed to protrude when the door closes in order to latch the door shut. The terminating means may be a magnetic means with permanent magnets in the jamb and lock.

Fig.1



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DOOR LATCH LOCK

In the conventional door latch lock in which a latch can moved by door handles from an extended position in which it locks the door in its frame to a withdrawn position in which the latch is disengaged from the frame, problems may arise when the door is open since the latch will protrude from the end surface of the door when the door handles are released. Clothes can be torn by catching on the latch; children may hurt themselves by falling against the latch. The present invention seeks to overcome such problems and is set out in claim 1.

Examples of the prior art and of the invention will now be described with reference to the accompanying drawings in which:-

Figure 1 is a perspective view of a conventional door latch lock,

Figure 2 is a perspective view of the striker plate for the lock of Figure 1,

Figure 3 is a horizontal section through the lock of Figure 1 and the striker plate of Figure 2 in the locked position of the lock,

Figure 4 is a vertical central longitudinal section showing a first embodiment of the invention,

Fig. 5 is a view along the line of A-A in Fig. 4,

Fig. 6 is a view along the line of B-B in Fig. 4,

Fig. 7 is a view along the line of C-C in Fig. 4,

Fig. 8 is a vertical central longitudinal section showing the door in its locked state at the time of door closure in the same embodiment,

Fig. 9 is a vertical central longitudinal section of a second embodiment,

Fig. 10 is a view along the line of D-D in Fig. 9,

Fig. 11 is a view along the line of E-E in Fig. 9,

Fig. 12 is a view along the line of F-F in Fig. 9,

Fig. 13 is a front view of a latch retention means for the lock of Fig. 9,

Fig. 14 is a view of the right-hand side of Fig. 13,

Fig. 15 is a plan view of Fig. 13, and

Fig. 16 is a vertical central longitudinal section of the latch retention state at the time of door opening in the second embodiment.

Figure 1 shows a conventional door latch lock 81 in which a latch 84 is movable by means of a handle 85 on each side of the door 82 from the illustrated position in which the latch 84 protrudes from the edge surface 83 of the door to a withdrawn position in which the latch does not protrude appreciably from the surface 83. Figure 2 shows the conventional door frame 86 formed with a recess 89 defined by a striker plate 88 fixed to the door frame by screws 87. The frame 86 is formed with a door stop 90. Figure 3 shows the door in its closed position with the latch 84 engaging the recess 89.

Figures 4-8 illustrate a first embodiment of the invention. A double leaf door 2 has a latch lock 1 fitted at its edge surface 2A. A striker plate 5 is mounted on the door frame 4 and defines a latch hole 6. The plate 5 has upper and lower mounting holes 32 for fixing screws, not shown. A latch 3 of the lock 1 can be extended from the door 2 to enter the hole 6 which is of a size as to allow free movement of the latch 3.

The lock 1 has a casing body 7 and a casing cover 8, a latch drive element 9, a square section latch actuation rod 10 with a return coil spring 15, actuation handles 11 and latch retention means in the form of a coil spring 12. Retention termination means are provided by permanent magnets 13 and 14 repectively fixed in a recess 17 in the outer end of the latch 3 and in a recess 31 in the base of the hole 6. A holder plate 16 covers the outer end of the lock 1 and has a central hole 34 for the latch 3 and mounting holes 35.

The latch 3 has a head portion 3A of generally elliptical cross section (see Fig. 5), a rod section 3B extending from

the rear of the head portion 3A and a spring seat 3C fixed to the rear end of the rod portion 3B. The door 2 is locked when the head portion 3A fits into the recess 6 of the striker plate 5.

The body 7 and the cover 8 are die-cast elements and the body 7 is provided with a mounting flange 7A at its front end. The flange 7A has a central hole 18 for guiding the travel of the latch and a mounting hole 19 above and below the latch, aligned with the mounting holes 35. The casing body 7 has a hole 20 on either side for the rod 10 and a latch stopper element 23 is mounted in front of the hole 20. After assembly of the latch components, the cover 8 is secured and properly located relative to the body 7 by means of its cover mounting screw hole 21 and positioning pin holes 22 at the rear end.

In the centre of the holder plate 16 there is a latch pass-through hole 34 and above and below there are mounting holes 35 which come into alignment with the mounting holes 19 provided in the flange 7A of the casing 7.

The drive element 9 has an approximately L-shape reciprocating member 25 and a rotation member 28 driven by the rod 10 and formed with a stop 27 and drive pawls 26 which engage sockets 29 in a coupling member 30 connected to the reciprocating member 25. Return coil spring 15 is wound around the rotation member 28, with one end 15A held by retention pin 33 and the other end 15B held by stop 27, biassing the handles 11 in the anticlockwise direction as seen in Figure 4. In one side of the reciprocating member 25 there is a shaft hole 24 through which the rod portion 3B slidably extends. As the door handles on the ends of rod 10 are turned against the bias of the spring 15, the latch 3 is withdrawn from the recess 6 towards the right in Figure 4.

Coil spring 12 is wound around the rod portion 3B, held between the spring seat 3C and the rear surface 25A of the front part of the member 25, and biases the latch 3 rearwardly towards the position shown in Figure 4 in which it is entirely withdrawn behind the front surface of the plate 16 and with the seat 3C engaging the stop 23. Even if the door handles 11 are turned the latch 3 does not move. If the handles are turned to move the rod 10 clockwise in Figure 4, the member 25 will move to the right to compress the spring 12, but the latch 3 is prevented from corresponding movement by the stop 23. If an attempt is made to turn the handles to move the rod anti-clockwise, it is prevented by the engagement of the stop 27 with the member 30.

The attractive force between the magnets 13 and 14 is made greater than the force exerted by the coil spring 12, so that as soon as the latch head portion 3A and the hole 6 become aligned, the attractive force of the magnets causes the latch to move forwards against the bias of the spring 12 and the latch 3 fits into and is retained in the latch hole 6, so locking the door.

The coil spring 12 provides a lost-motion device since the portion 3B can only follow the motion of the drive assembly members 25 and 30 to the left in Figure 4 when the attractive force between the magnets 13 and 14 overcomes the bias of the spring 12. There will also be a delay after motion of the drive assembly to the right before the portion 3B follows, as the coil spring compresses.

The operation of this embodiment will be described. First, when the door is closed, the retention of the latch 3 by the spring 12 is terminated by the attractive force of the permanent magnets 13 and 14 constituting retention termination means and the head portion 3A of the latch 3 moves inside the latch hole 6 provided in the striker plate 5 of the door frame 4 as shown in Fig. 8, and so the door 2

is locked and, as long as an actuation handle 11 is not actuated, the door 2 does not open.

When, in order to open the door 2, an actuation handle 11 of the door 2 is turned to rotate the bar 10 clockwise as seen in Figure 4, the rotation member 28, acting via the coupling member 30, causes the member 25 to move to the right as seen in Figure 5, and so the permanent magnets 13 and 14 constituting retention termination means are forcibly separated, the latch 3 is drawn back by the compressed coil spring 12 until it contacts the stop 23. The door 2 can now be pushed open, since the latch head portion 3A has moved clear of the latch hole 6 of the striker plate 5 and the door lock has been released.

When the actuation handle 11 of the door 2 is released, the rotation member 28 is automatically rotated anti-clockwise as seen in Fig. 5 by the return coil spring 15 and the member 25 is advanced to the left. Since the attractive force between the magnets 13 and 14 constituting retention termination means does not act at this time, the latch 3 is retained by the force exerted by the coil spring 12 and does not move forward but is held in the state shown in Fig. 5, in which its head portion 3A is withdrawn into the casing 7.

When the door 2 is in an opened state, the head portion 3A of the latch 3 is inside the casing 7 and does not project from the door edge surface 2A, and so the tip end of the head portion 3A of the latch 3 cannot catch on clothes or cause the other problems described above.

As the door 2 is closed, the moment the latch head portion 3A and the latch hole 6 of the striker plate 5 come into alignment, the attractive force of the magnets 13 and 14 constituting retention termination means terminates the retention by the latch retention means constituted by the

coil spring 12, and the latch head portion 3A fits into the latch hole 6, so locking the door.

In the first embodiment described above, one of the magnets 13 and 14 may be replaced by a piece of iron; the magnet 14 may be replaced by an electromagnet; and the coupling member 30 and member 25 constituting the drive element 9 may be made an integral structure.

With the above-described first embodiment, the structure is extremely simple, retention of the latch 3 inside the casing 7 and termination of the retention are effected smoothly and surely, the device is very safe, since the head portion 3A of the latch 3 does not project out from the door 2 edge surface 2A when the door 2 is open, and the structure can, with a simple modification, be adopted in conventionally employed lock devices and it can be produced economically.

Figs. 9-16 show a second embodiment of the invention. 41 is a latch lock which, as in the first embodiment, is mounted at an edge portion of a door 2, the arrangement being that a latch 42 can project or be withdrawn from the edge surface 2A of the door 2 and can be inserted into or moved away from the latch hole 6 of a striker plate 5 mounted in the door frame 4.

The latch lock 41 consists of the latch 42, a casing 43 and its cover 44, which are made of a non-magnetic metal (eg, zinc), a latch drive element 45, a square section latch actuation rod 46, actuation handles 47, a coil spring 48 for urging the latch to move out, a latch drive element return spring 49, a latch retention means 50, a permanent magnet 51 constituting a latch retention termination means, and a holder plate 52 constituted by a stainless steel plate.

The latch 42 consists of a head portion 42A with a generally elliptical cross-section, a rod portion 42B that extends to the rear of the head portion 42A, and a latch drive element engagement member 42C that is provided at the rear end of the rod portion 42B. The front end of the head portion 42A is made a flat surface, and in its top surface a plurality of forwardly inclined sawtooth-like retention grooves 53 are formed in the direction normal to the axis of the rod portion 42B, the arrangement being such that the door 2 is locked by fitting the head portion 42A into the latch hole 6 of the striker plate 5.

The casing 48 is produced by die-casting and has a box shape, and is provided with a mounting flange 43A at its front end. There is a latch projection-withdrawal guide hole 54 in the central portion of this flange 43A, and mounting holes 55 are provided above and below. A rod support-guide member 56 is provided inside the casing 43 corresponding to the guide hole 54; below and to the rear of this guide member there is a latch actuation rod pass-through hole 57 and below the rod portion 42B of the latch 42 there is a drive element return spring accommodation section 58 in which the spring 49 is fitted.

Above the latch projection-withdrawal guide hole 54, a vertically extending notch opening 59 for insertion and mounting of a latch retention element is provided in communication with the guide hole 54, vertically extending latch retention element guide grooves 60 are provided in the inner surface of the cover 44 and the casing inner walLs on the left and right of the notch opening 59, a cover mounting screw hole 61 is provided in a side wall and, as shown in Fig. 12, the cover 44 is detachably mounted by means of a mounting screw 62. A latch actuation rod pass-through hole (not shown) is also provided in the cover 44.

The drive element 45 is externally fitted and fixed on the latch actuation rod 46, a fork-shaped latch rod portion drive piece 63 projects from its upper side and a drive element return actuation lever 54 projects from its lower side. When the front surface of the drive piece 63 contacts the rear side of the rod support-guide member 56, forward movement of the latch 42 is restrained by the retention member 42C coming into contact with the rear surface of the drive piece 63. The coil spring 48 for urging the latch forwards is externally fitted on the rod portion 42B, in the space between the rod support-guide member 56 and the rear surface of the latch head portion 42A, and it constantly urges the latch forwards and outwards. The rear end of the above-noted spring 49 contacts the front surface of the drive element return actuation lever 64 via a contact piece 65, and the latch drive element 45 is urged anticlockwise in Fig. 9. The arrangement is made such that when the actuation handle 47 turns the drive element 45 clockwise in Fig. 9, the latch 42 is withdrawn into the casing 43 counter to the force exerted by the spring 48.

As shown in Fig. 9 and Figs. 13 - 15, the latch retention means 50 consists of a latch retention element 66 and permanent magnet 67 that fits inside this element 66. The retention element 66 has a engagement pawl 68 at its lower end, it has the shape of a box that is open at the front and has slide guide projections 69 on its left and right sides, and it is moulded from hard synthetic resin. The lower end of the retention pawl 68 is curved and downwardly inclined, so as to allow it to engage the retention grooves 53 of the latch 42.

The slide guide projections 69 fit into the guide grooves 60 of the casing 43 and cover 44, so permitting free upward and downward sliding movement. The arrangement is that the latch retention means 50 moves down under its own weight and the retention pawl 68 fits into and engages a retention

groove 53 of the latch 42. The permanent magnet 67 has its south pole at the top and its north pole at the bottom.

The magnet 51 is inserted and fixed in a manner such that its north pole is uppermost, in a magnet accommodation recess 70 which is formed above the latch hole 6 of the striker plate 5 and is also located higher than the permanent magnet 67, the arrangement being that when the door 2 is closed and the latch head portion 42A and the hole 6 cone into alignment, the attractive force of the two magnets 51 and 57 causes the latch retention means 50 to move upwards, whereby the retention pawl 68 is moved clear of the retention grooves 53 and the latch retention is terminated. On termination of the latch retention, the latch 42 is moved forwards by the coil spring 48 and its head portion 42A is inserted into the hole 6, so locking the door 2.

Mounting holes 71 are provided in upper and lower end portions of the striker plate 5. On the centre of the holder plate 52 there is a latch pass-through portion 72 corresponding to the latch projection-withdrawal guide hole 54 of the casing 43 and in its upper and lower end portions there are mounting holes 73 corresponding to the mounting holes 55 provided in the flange 43A, and the notch opening 59 in the front surface of the easing 43 is sealed by the holder plate 52.

The operation of the above second embodiment will now be described. First, as illustrated in Fig. 9, when the door 2 is closed, the latch retention means 50 is drawn up by the magnetic force of the permanent magnets 51 and 67 and its retention pawi 68 is moved clear of the retention grooves 53 of the latch head portion 42A, so terminating the retention of the latch 42, and the latch head portion 42A enters the latch hole 6 provided in the striker plate 5 of the door frame 4, and so the door 2 is locked and, as

long as an actuation handle 47 is not actuated, the door 2 cannot be opened.

When, in order to open the door 2, an actuation handle 47 of the door 2 is turned to rotate the drive element 45 clockwise, its drive pawl 63 causes the latch 43 to move back in, counter to the spring force of the coil spring 48, to the right in Fig. 9, so producing the lock release state indicated by the chain dotted lines in Fig. 9. When, with the door 2 still in this lock release state, the door 2 is opened by pushing or pulling the actuation handle 47, the magnetic force of the permanent magnet 51 constituting a retention termination means no longer acts, and so the retention element 66 of the latch retention means 50 automatically falls and its retention pawl 68 fits into and engages a retention groove 53 of the latch head portion 42A, and the latch 42 is therefore retained with its head portion 42A remaining inside the casing 43, as shown in Fig. 16.

When the actuation handle 47 is released, the return spring 49 causes the drive element 45 to rotate back anticlockwise as seen in Fig. 16, but the latch 42 remains held in its withdrawn state. Thus, when the door 2 is open, the front end of the head of the latch 42 does not project from the door edge surface 2A, and so the head portion 42A of the latch 42 cannot catch on clothes or cause the problems outlined above. On closure of the door 2, the moment the latch head portion 42A and the latch hole 6 come into alignment, the retention element 66 is drawn up by the magnetic attraction between the permanent magnets 51 and 67 and its retention pawl 68 is moved clear of the retention grooves 53 of the latch 42, so terminating the retention, and consequently the latch 42 is moved forwards to the left in Fig. 9 by the force exerted by the coil spring 48 and its head portion 42A is inserted into the latch hole 6, so establishing the locked state shown in Fig. 9.

In the second embodiment described above, the permanent magnet 51 may be replaced by an electromagnet; the drive element return spring 49 may be provided around the drive element 45, as in the first embodiment.

With the above-described second embodiment, retention of the latch 42 inside the casing 43 and release from this retention are effected smoothly and surely, the device is very safe, since the head portion 42A of the latch 42 does not project from the door edge surface 2A when the door 2 is open, and locking and release of the door 2 are effected simply and surely.

CLAIMS

1. A door latch lock comprising a casing, a handle, a latch movable to a position in which it protrudes from the casing for engagement with a striker plate, means to restrain the latch when it has been withdrawn by the handle from said position from returning to said position and means to terminate the operation of the restraining means on closure of the door.

2. A lock as claimed in claim 1 wherein the terminating means comprises magnet means.

3. A lock as claimed in claim 1 or claim 2 wherein the restraining means comprises a lost-motion device connected between the handle and the latch and a coil spring to take up the lost motion so as to maintain the latch within the casing whatever the position of the handle, the terminating means being arranged to overcome the bias of the coil spring.

4. A lock as claimed in claim 1 or claim 2 wherein the restraining means comprises a releasable stop for preventing movement of the latch out of the casing.

5. A lock as claimed in any one of claims 1 to 4 comprising a drive assembly connected between the handle and the latch including a rotable member provided with drive pawls and a reciprocatable member provided with engagement holes for receiving said pawls.

6. A door latch lock as claimed in claim 1 substantially as herein described with reference to the accompanying drawings.

Fig 1

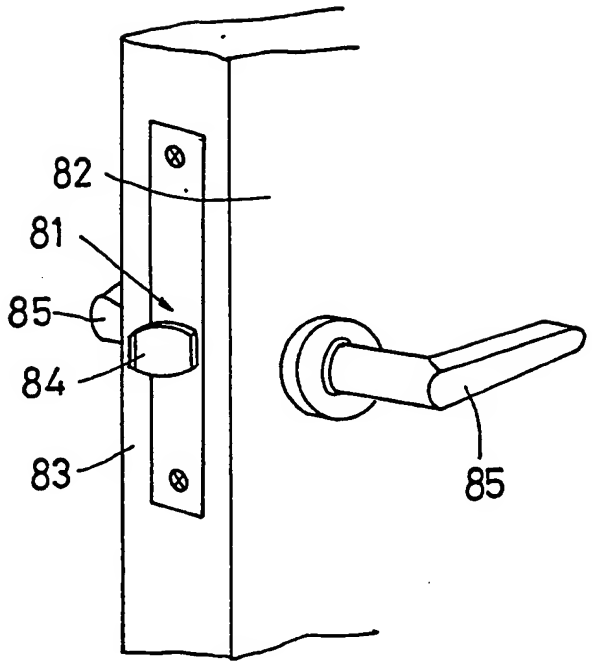


Fig 2

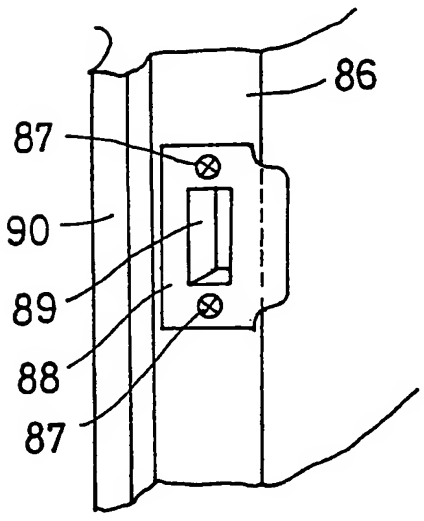
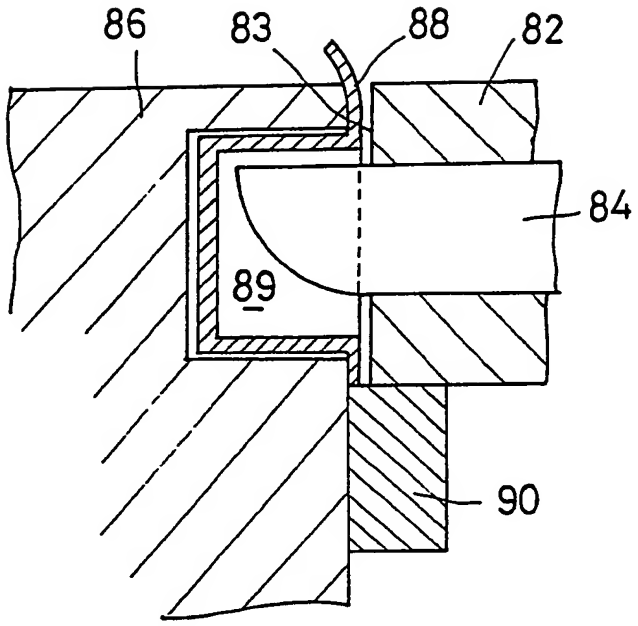


Fig 3



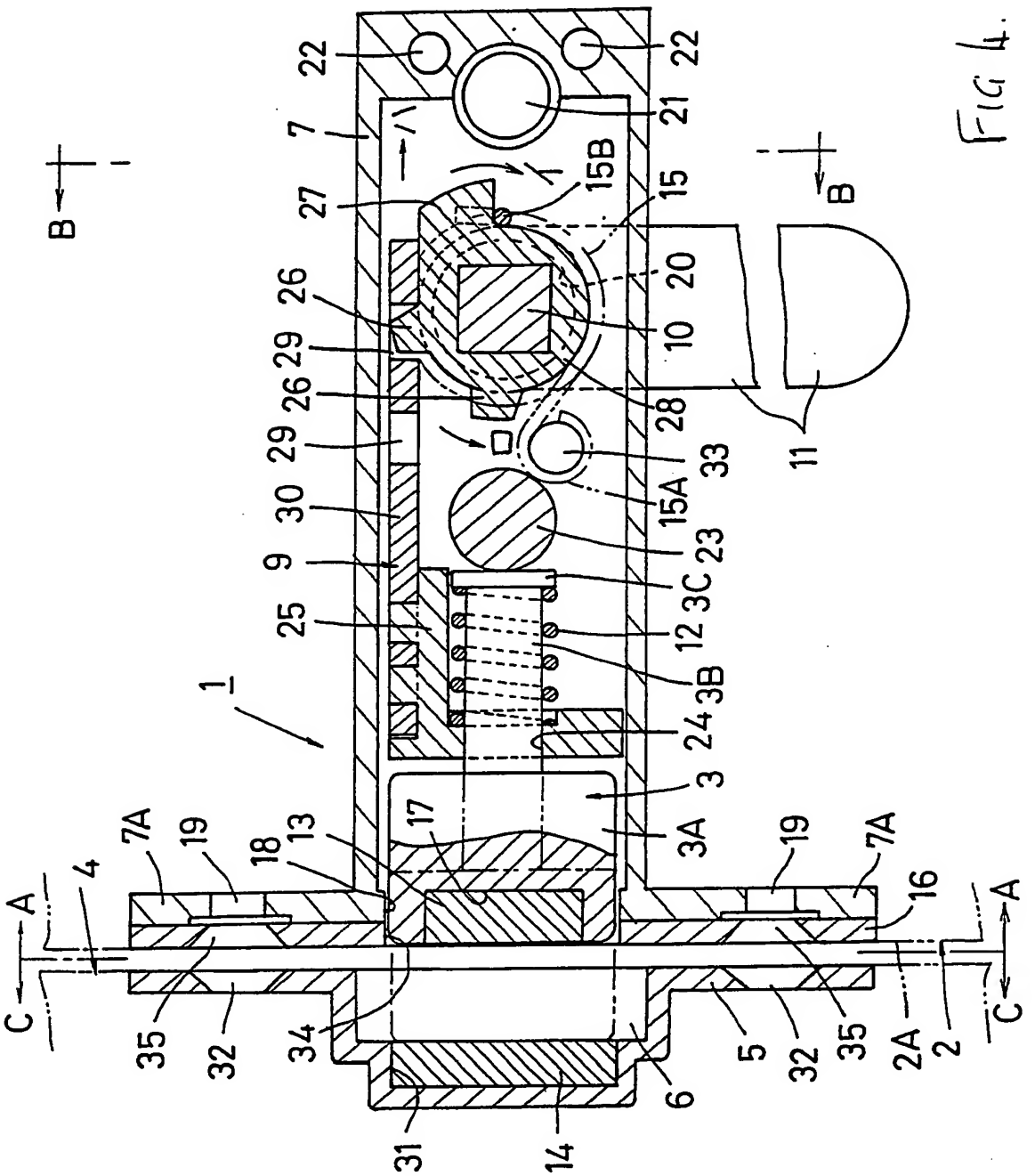

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FIG 4.

Fig.5

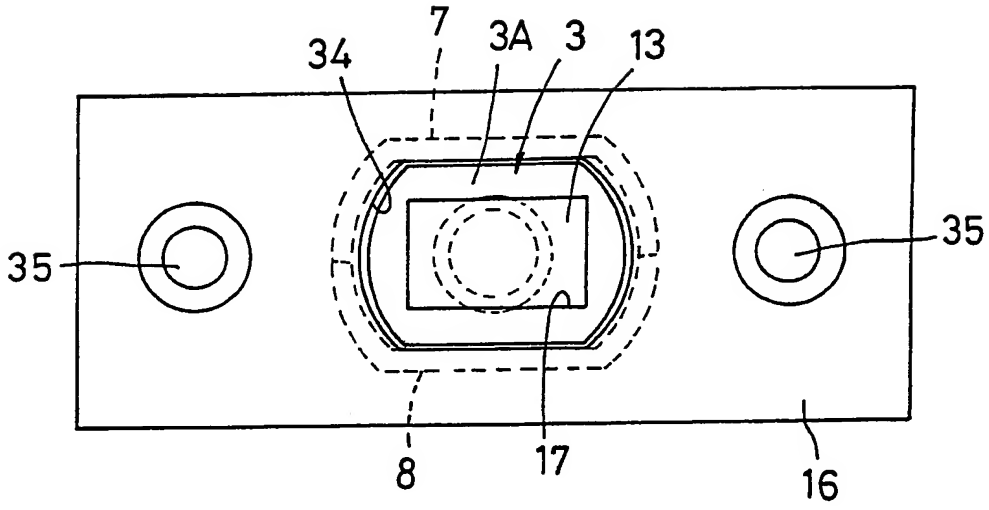


Fig.7

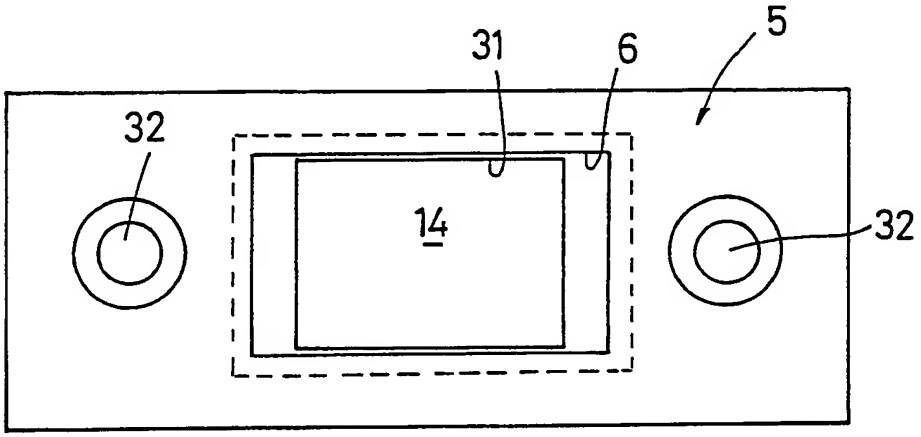
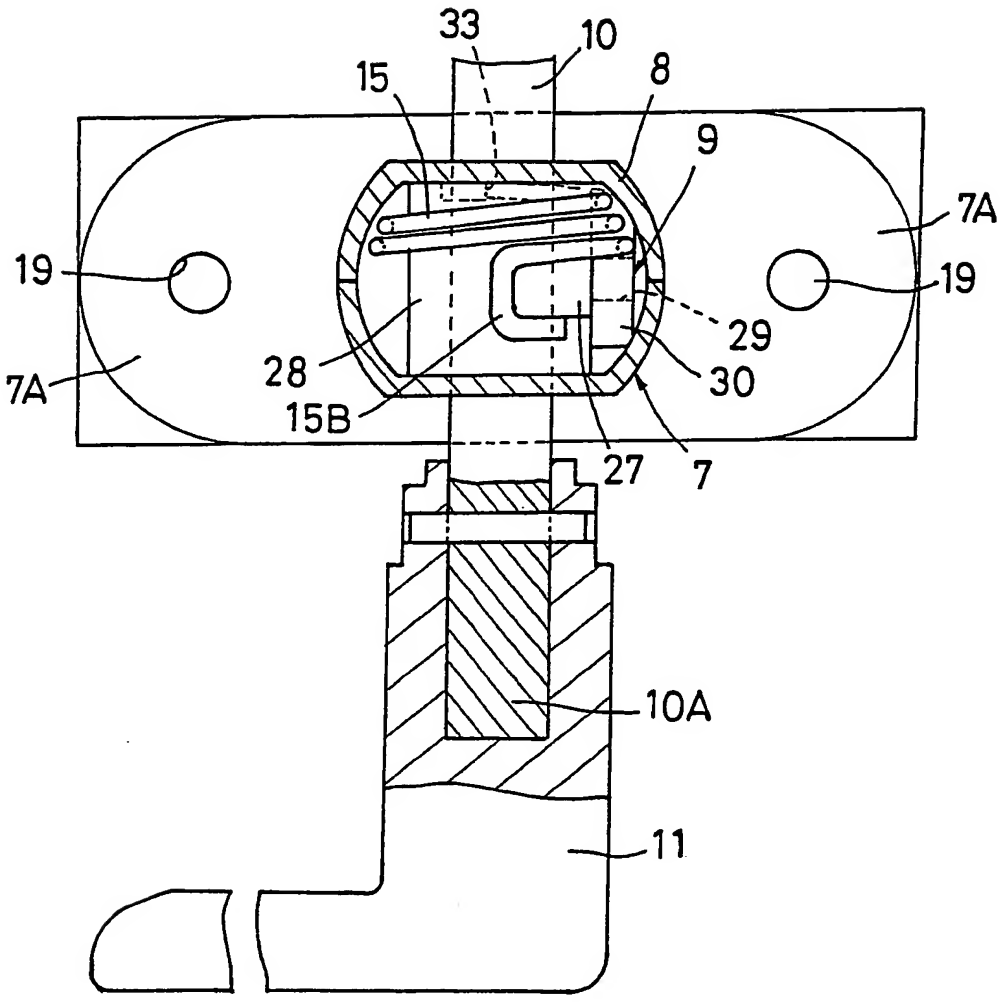


Fig. 6



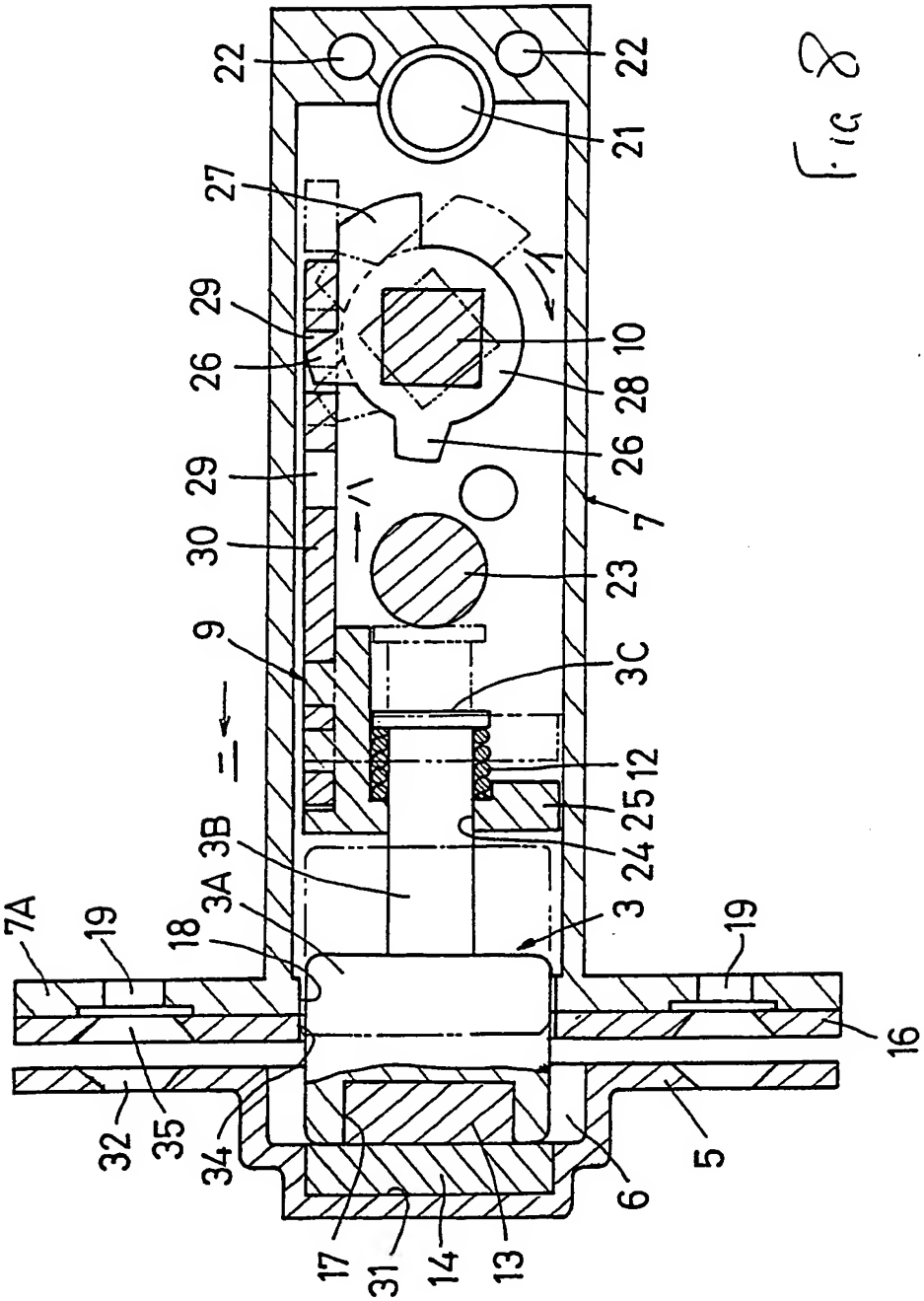

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FIG 8

Fig.9

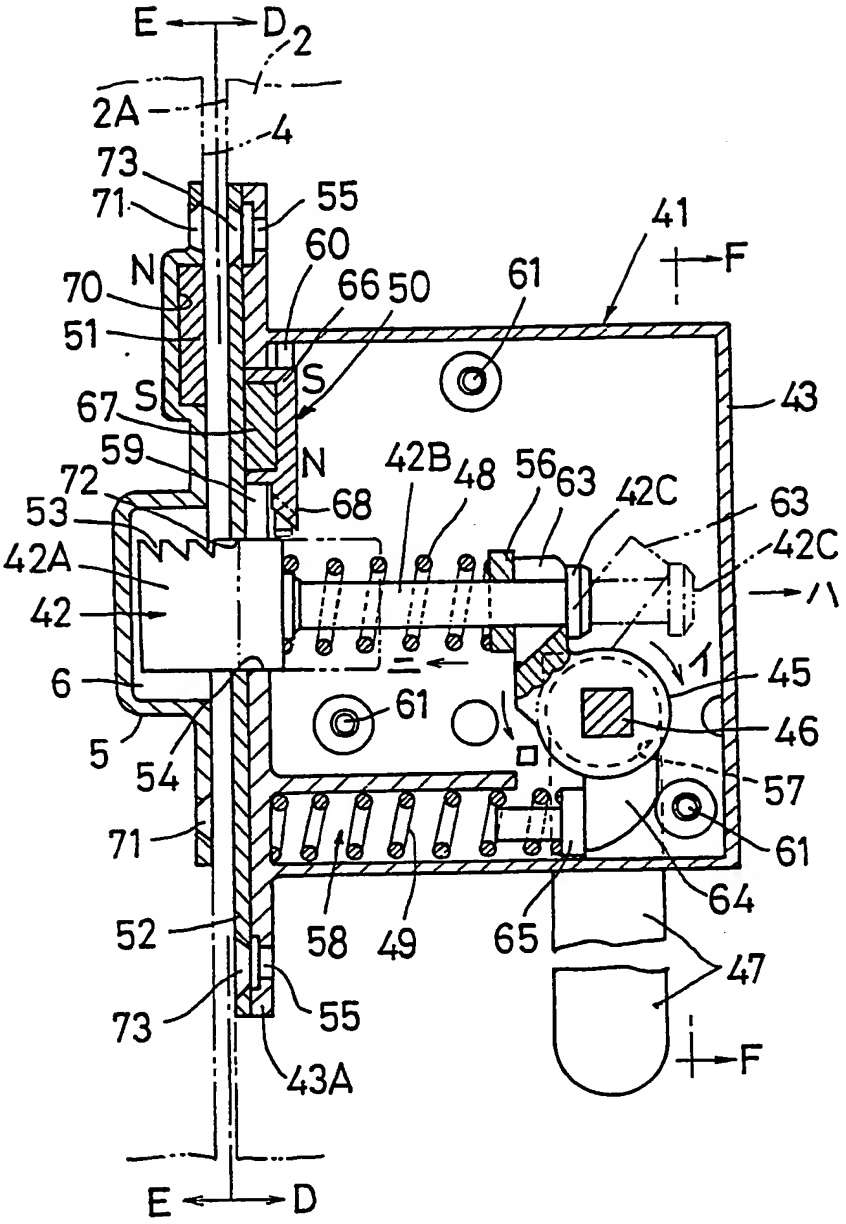
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Fig 10

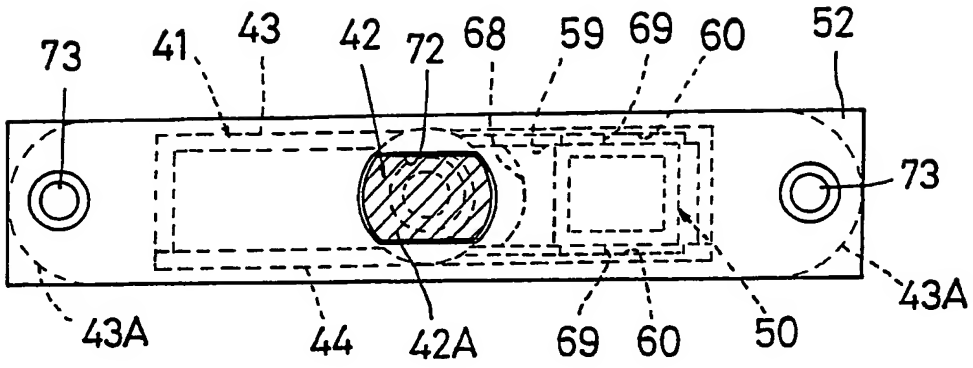


Fig 11

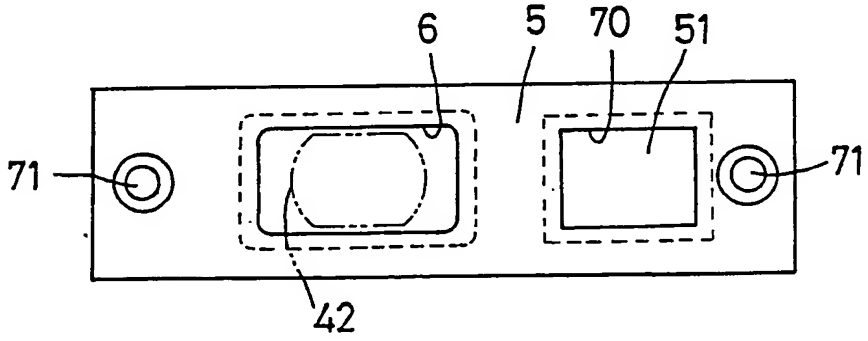


Fig 12

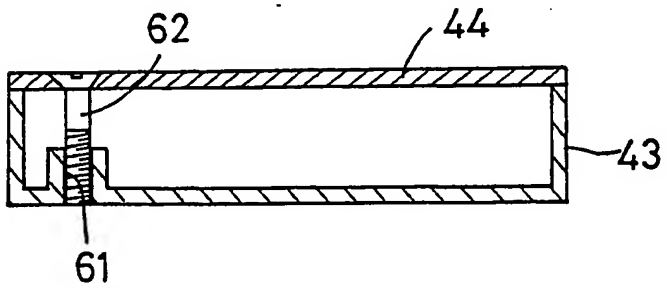


Fig 13

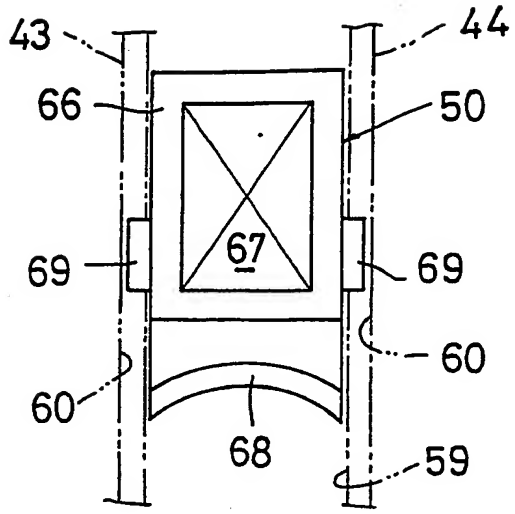


Fig 14

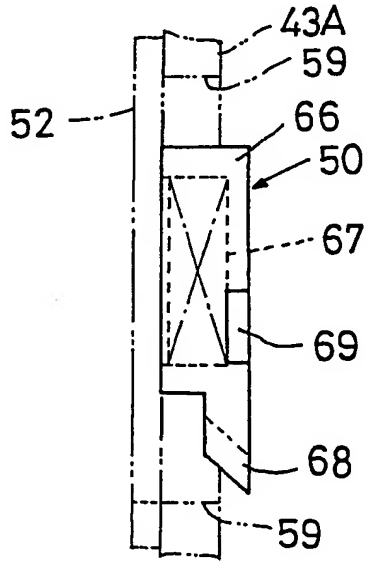


Fig 15

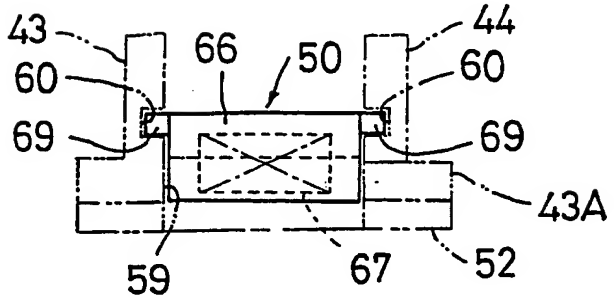
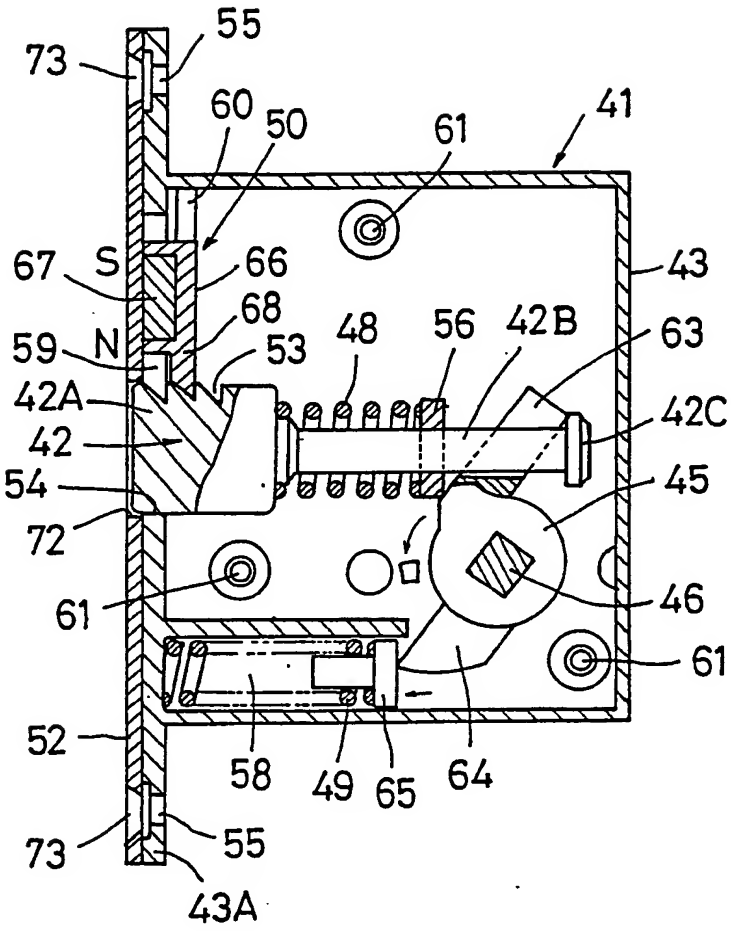


Fig 16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Application number
GB 9426308.4

Relevant Technical Fields

(i) UK Cl (Ed.N) E2A (ABL, ABX, AMXE)

(ii) Int Cl (Ed.6) E05B 47/00; E05C 1/12

Search Examiner
A ANGELE

Date of completion of Search
28 MARCH 1995

Databases (see below)
(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii)

Documents considered relevant following a search in respect of Claims :-
ALL

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages		Relevant to claim(s)
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X	GB 1519608 A	(DOVER)	1, 4
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